AMENDMENTS TO THE DRAWINGS

The attached sheet of drawings includes changes to Figs. 2 and 3. The sheet replaces the original sheet 2 of the drawings as filed.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

REMARKS/ARGUMENTS

Reconsideration and withdrawal of the outstanding grounds of objection and/or rejection are respectfully requested in light of the above amendments and the remarks that follow.

The Examiner has objected to the drawings for failing to disclose both the first bond coat layer and second bond coat layer as called for in claims 4-6, 9 and 10-12.

Applicants have submitted herewith a new sheet 2 incorporating amended Figures 2 and 3 with reference numerals indicating both the bond coat and ceramic top coat in Figure 2. In addition, Figure 2 has been labeled, "Prior Art" as required by the Examiner.

The Examiner has objected to the specification, identifying certain informalities on page 3 of the Official Action.

The informalities have been corrected in the manner suggested by the Examiner.

The Examiner has also objected to the specification as filing to provide proper antecedent basis for the term "about" as used in claims 2, 3 and 8 with respect to certain dimensional limitations.

In order to remedy the informality, applicants have amended the specification where appropriate to provide the required antecedent basis.

The Examiner's further suggestion on page 4 of the Official Action regarding language in claim 1 has also been adopted.

The Examiner has objected to claims 1-9 and 13 for the reasons stated on page 4 of the Official Action.

In response claims 1 and 13 have been amended as suggested.

The Examiner has rejected claims 10-13 under 35 U.S.C. § 112 as indefinite. According to the Examiner, "said region" and "the specified diameter" in claim 13 are unclear and, with

regard to claim 13, the Examiner contends that the recitation of a turbine component having a protective coating therein is inaccurate, in that the coating is located on the component. With regard to claim 13, the Examiner contends that the phrase "with a counterbore and an exit end" is incomplete and unclear.

In response, applicants have further amended claim 10 to refer to "a region proximate said film cooling holes" to thereby resolve the indefiniteness. Claim 10 has also been amended to recite that each hole has a specified diameter, thereby resolving the indefiniteness with respect to the term "the specified diameter."

Claim 13 has been amended to specify that the component has a protective coating "thereon" thereby resolving the inaccuracy of the language utilized in any claim that is filed.

Claim 13 has been amended as suggested by the Examiner, thereby resolving the clarity issue with respect to that claim.

The Examiner has rejected claims 1, 2, 4-6 and 13 as anticipated by Gupta et al. (U.S. Patent No. 5,771,577).

Gupta discloses a method for making a fluid cooled article with a protective coating. Gupta discloses various configuration for film cooling holes, with special accommodation for excess coating material so as not to restrict fluid flow through the film cooling hole. In each case, however, in Figure 1, for example, the diameter of the film cooling hole 12 increases from the inlet opening 14 to the outlet 18.

Figure 3 discloses various other configurations for enlarging the exit end of the cooling hole by simply enlarging the exit ends of the film cooling hole by gradually tapered or curved surfaces, however, it is not possible to produce a smooth transition along the cooling hole wall. In other words, the boundary layer of the cooling flow resulting from an unsmooth wall, due to

TBC deposit, will lead to flow separation. Since the cooling flow will separate itself from the wall before exiting the film cooling hole, a cooling film attachment at the metal exterior surface will be greatly compromised. In contrast, the configuration of the film cooling holes in accordance with the present invention incorporate a concentric counterbore where the bore and counterbore are parallel, with an abrupt diameter change, i.e., at a 90° shoulder between the bore and the counterbore. With this arrangement, when the excess coating material flows into the counterbore, a smooth transmission occurs between the excess coating material and the film cooling hole. This is accomplished by carefully calculated and calibrated cooling hole diameters, abruptly connected, and combined with TBC spraying processes (taking into account the density of the TBC particles, speed and temperature of a TBC jet).

In addition, the configuration in accordance with the present invention allows one to maintain the required relationship between the pressures of cooling and hot gas flows, i.e., (Pcool/Pgas-1.0) > (backflow margin) where "backflow margin" is a required value in order to ensure that no hot gas fluid will be ingested back into the interior cavities during a range of gas turbine operating conditions. The cooling flow pressure associated with the present features will remain the same as the pressure for a straight holes without TBCs. Where the exit of the geometries of the cooling holes diverge as depicted in Figures 3A-3D of Gupta, the cooling flow pressure will decrease with increasing cross-section of the cooling hole exit, due to coolant fluid expansion along the divergent section. As a result, the backflow margin will be reduced. In order to regain proper backflow margin, a higher cooling flow pressure will thus be needed. The cooling flows driven by the additional pressure will, in turn, lead to penalties on the total efficiency of a gas turbine.

In order to more clearly distinguish the present invention from Gupta, applicants have amended independent claims 1 and 13 to specify that the hole and respective counterbore are parallel and are connected by substantially 90° shoulder. The claims also require that the counterbore be concentric with the remainder of the film cooling hole. It is respectfully submitted that the subject matter of independent claims 1 and 13 as well as dependent claims 2 and 4-6 are patentably distinguishable over Gupta. No new matter has been added, the limitations are supported in the original specification and drawings. In this regard, Figure 3 has been amended to add reference numeral 42 and the specification has been amended to refer to numeral 42 and to expressly state that which is clearly shown in the drawings as filed regarding the configuration of shoulder 42.

The Examiner has rejected claims 1 and 2, 4-7 and 9-12 under 35 U.S.C. § 103 as unpatentable over Japanese Patent (6032903) in view of Gupta. The Examiner considers the Japanese patent as disclosing a turbine component substantially as claimed absent a coating in the region of the film cooling hole. The Examiner contends that in light of the disclosure in Gupta, it would have been obvious at the time the invention was made to provide the turbine blade of the Japanese reference with a coating as described in Gupta.

The Japanese patent discloses in Figure 5(b) film cooling hole with an enlarged exit end 15. Note, however, that the film cooling hole 16 and enlarged exit end 15 are not concentric as required by independent claims 1 and 10 of this application. Moreover, the Japanese patent is not at all concerned with, and nor does it address, any problems with respect to excess coatings of any kind in the region surrounding the film cooling hole. Moreover, even if one of ordinary skill in the art were to add a TBC coating as taught by Gupta, it would also appear that the outlet configuration of the hole in the Japanese patent would be modified as also taught by Gupta to

include a gradually enlarging exit configuration which is, in effect, the essence of the invention in Gupta. As such, the combination would not produce the configuration as now required by the independent claims of this application.

The Examiner has rejected claim 3 under 35 U.S.C. § 103 as unpatentable over Gupta in view of Fric (U.S. Patent No. 6,383,602). Fric is alleged to disclose a film cooling hole with a counterbore at the exit end thereof having a depth of about 0.030 inch. The counterbore in Fric, however, is also not concentric with the remainder of the cooling hole, and thus suffers the same deficiencies as Gupta, particularly if coated. Thus, even when combined with Gupta, the combination fails to disclose or suggest the subject matter of claim 1 from which claim 3 depends.

Claim 8 has been rejected under 35 U.S.C. § 103 as unpatentable over the Japanese '903 reference, Gupta and Fric '602.

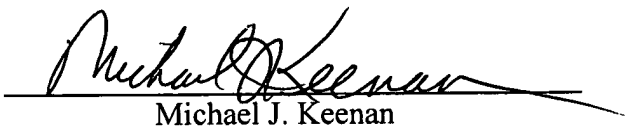
For the same reasons presented above, it is respectfully submitted that the combination of references as applied by the Examiner fails to produce the invention as defined by the combination of claims 1, 7 and 8.

For all of the above reasons, it is respectfully submitted that the application is now in condition for immediate allowance and early passage to issue is requested. In the event, any

small matters remain outstanding, the Examiner is encouraged to telephone the undersigned so that the prosecution of this application can be expeditiously concluded.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 
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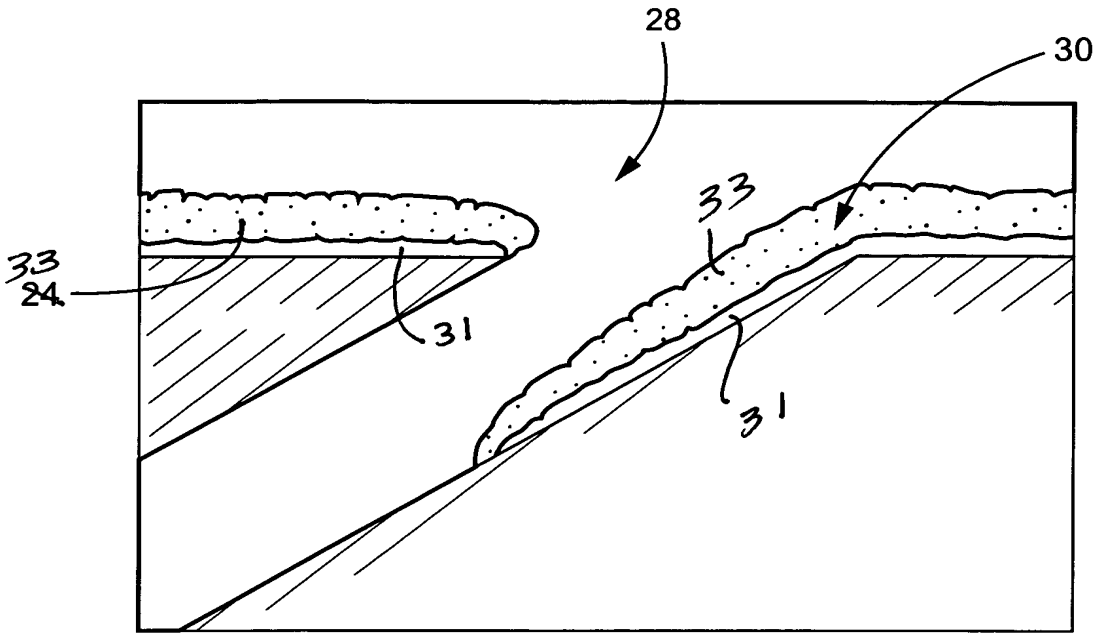

Fig. 2 (PRIOR ART)

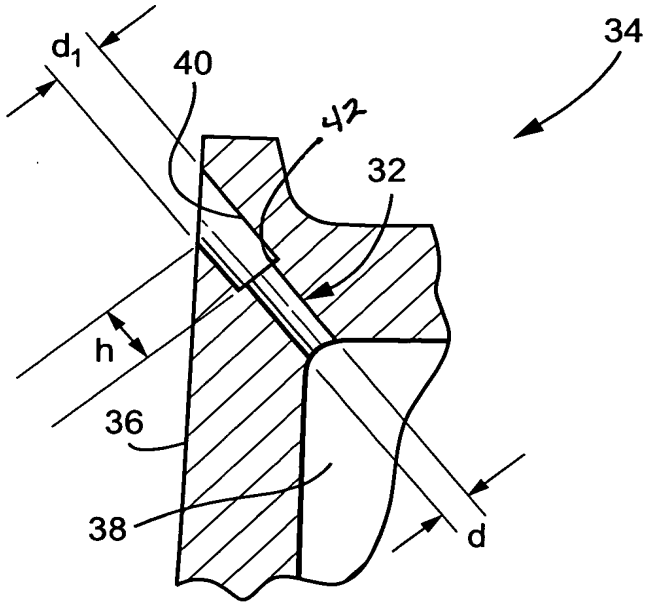

Fig. 3